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CLAIMS:

1. A method of forming a silicon dioxide layer, comprising:  
forming a high density plasma proximate a substrate;  
flowing gases into the plasma, at least some of the gases forming silicon dioxide;  
depositing the silicon dioxide formed from the gases over the substrate; and  
while depositing the silicon dioxide, maintaining a temperature of the substrate at greater than or equal to about 500° C.
2. The method of claim 1 further comprising:  
forming openings in the substrate; and  
depositing the silicon dioxide within the openings.
3. The method of claim 1 wherein the gases comprise  $\text{SiH}_4$  and oxygen.
4. The method of claim 1 wherein the gases comprise  $\text{SiH}_4$ , oxygen and argon.

1           5.     A method of forming a silicon dioxide layer, comprising:  
2           forming a high density plasma proximate a substrate;  
3           flowing gases into the plasma, at least some of the gases forming  
4           silicon dioxide;  
5           depositing the silicon dioxide formed from the gases over the  
6           substrate; and  
7           not cooling the substrate with a coolant gas while depositing the  
8           silicon dioxide.

9  
10          6.     The method of claim 5 further comprising maintaining a  
11          temperature of the substrate at greater than or equal to 500° C during  
12          the depositing.

13  
14          7.     A method of forming a silicon dioxide layer, comprising:  
15          forming a high density plasma proximate a substrate;  
16          flowing gases into the plasma, at least some of the gases forming  
17          silicon dioxide;  
18          depositing the silicon dioxide formed from the gases over the  
19          substrate at a deposition rate;  
20          while depositing, etching the deposited silicon dioxide with the  
21          plasma at an etch rate; and  
22          during the etching and depositing, maintaining a temperature of  
23          the substrate at greater than or equal to about 500° C.

1           8.    The method of claim 7 wherein the gases comprise  $\text{SiH}_4$   
2   and oxygen.

3  
4           9.    The method of claim 7 wherein the gases comprise  $\text{SiH}_4$ ,  
5   oxygen and argon.

6  
7           10.   The method of claim 7 further comprising:  
8           forming openings in the substrate; and  
9           depositing the silicon dioxide within the openings.

10  
11          11.   A method of forming a silicon dioxide layer, comprising:  
12          forming a high density plasma proximate a substrate;  
13          flowing gases into the plasma, at least some of the gases forming  
14          silicon dioxide;

15          depositing the silicon dioxide formed from the gases over the  
16          substrate at a deposition rate;

17          while depositing, etching the deposited silicon dioxide with the  
18          plasma at an etch rate; and

19          during the etching and depositing, maintaining a temperature of  
20          the substrate at greater than or equal to about  $500^\circ\text{C}$ , the maintaining  
21          a temperature comprising not exposing the substrate to a coolant gas.

1 12. A method of forming a silicon dioxide layer, comprising:  
2 forming a high density plasma proximate a substrate;  
3 flowing gases into the plasma, at least some of the gases forming  
4 silicon dioxide;  
5 depositing the silicon dioxide formed from the gases over the  
6 substrate at a deposition rate;  
7 while depositing, etching the deposited silicon dioxide with the  
8 plasma at an etch rate under elevated temperature conditions to achieve  
9 a ratio of deposition rate to etch rate that is at least two-times greater  
10 than would otherwise occur under identical processing conditions of an  
11 identical substrate at lower temperature conditions.

1 13. A method of forming a shallow trench isolation region,  
2 comprising the following sequential steps:

3 forming openings extending into a substrate, the openings extending  
4 less than or equal to about 1 micron into the substrate;

5 heating the substrate in the presence of oxygen to form a first  
6 layer of silicon dioxide within the openings; and

7 forming a second layer of silicon dioxide within the openings to  
8 fill the openings, the forming the second layer of silicon dioxide  
9 comprising:

10 forming a high density plasma proximate the substrate;

11 flowing gases into the plasma, at least some of the gases  
12 forming silicon dioxide;

13 maintaining the substrate at a temperature of at least about  
14 500° C; and

15 while maintaining the substrate at said temperature,  
16 depositing the silicon dioxide formed from the gases within the  
17 openings.

18  
19 14. The method of claim 13 wherein the gases comprise  $\text{SiH}_4$   
20 and oxygen.

21  
22 15. The method of claim 13 wherein the maintaining the  
23 temperature of the substrate comprises heating the substrate with the  
24 plasma.

1           16. The method of claim 13 wherein the silicon dioxide is  
2 deposited at a deposition rate, and further comprising etching the  
3 deposited silicon dioxide with the plasma at an etch rate, a ratio of the  
4 deposition rate to the etch rate being at least about 4:1.

5  
6           17. The method of claim 13 wherein the ratio of the deposition  
7 rate to the etch rate is at least about 6:1.

8  
9           18. The method of claim 13 wherein the ratio of the deposition  
10 rate to the etch rate is at least about 9:1.

11  
12           19. A method of forming a silicon dioxide layer, comprising:  
13 forming a high density plasma proximate a substrate, the plasma  
14 comprising silicon dioxide precursors, the substrate comprising an opening  
15 having an aspect ratio of at least about 1;

16 forming silicon dioxide from the precursors, the silicon dioxide  
17 being deposited within the opening at a deposition rate; and

18 while depositing, etching the silicon dioxide deposited within the  
19 opening, the etching comprising etching with the plasma at an etch rate;  
20 a ratio of the deposition rate to the etch rate being at least about 4:1.

21  
22           20. The method of claim 19 wherein the opening has an aspect  
23 ratio of from about 2.5 to about 1.

1           21. The method of claim 19 further comprising:  
2           placing the substrate in a reaction chamber, the reaction chamber  
3           comprising inductive coils to generate the plasma; the depositing and  
4           etching occurring in the reaction chamber;  
5           providing a first bias to the inductive coils; and  
6           during the etching, providing a second bias to the substrate.

7  
8           22. A method of forming a silicon dioxide layer, comprising:  
9           forming a high density plasma proximate a substrate, the substrate  
10          comprising an opening having an aspect ratio of at least about 1;  
11          flowing gases into the plasma, at least some of the gases forming  
12          silicon dioxide;  
13          depositing the silicon dioxide formed from the gases within the  
14          opening at a deposition rate; and  
15          while depositing, etching the silicon dioxide deposited within the  
16          opening with the plasma at an etch rate; a ratio of the deposition rate  
17          to the etch rate being at least about 4:1.

18  
19          23. The method of claim 22 wherein the opening has an aspect  
20          ratio of from about 2.5 to about 1.

21  
22          24. The method of claim 22 wherein the ratio of the deposition  
23          rate to the etch rate is at least about 6:1.  
24

1           25. The method of claim 22 wherein the ratio of the deposition  
2 rate to the etch rate is at least about 9:1.

3  
4           26. The method of claim 22 further comprising maintaining a  
5 temperature of the substrate at greater than or equal to about 500° C  
6 during the deposition and etching.

7  
8           27. The method of claim 22 further comprising:  
9 forming openings in the substrate; and  
10 depositing the silicon dioxide within the openings.

11  
12           28. The method of claim 22 wherein the gases comprise SiH<sub>4</sub>  
13 and oxygen.

14  
15           29. The method of claim 22 wherein the gases comprise SiH<sub>4</sub>,  
16 oxygen and argon.

17  
18           30. The method of claim 22 wherein the gases are a mixture  
19 consisting essentially of SiH<sub>4</sub>, oxygen and argon.  
20  
21  
22  
23  
24

1           31. A method of forming a silicon dioxide layer, comprising:  
2           forming a high density plasma proximate a substrate, the substrate  
3           comprising a step;  
4           flowing gases into the plasma, at least some of the gases forming  
5           silicon dioxide;  
6           depositing the silicon dioxide formed from the gases over the  
7           substrate step; and  
8           while depositing the silicon dioxide, maintaining a temperature of  
9           the substrate at greater than or equal to about 500° C, the depositing  
10          achieving better step coverage than would otherwise occur at lower  
11          temperatures.

12  
13          32. The method of claim 31 further comprising:  
14          forming openings in the substrate; and  
15          depositing the silicon dioxide within the openings.

16  
17          33. The method of claim 31 wherein the gases comprise  $\text{SiH}_4$   
18          and oxygen.

19  
20          34. The method of claim 31 wherein the gases comprise  $\text{SiH}_4$ ,  
21          oxygen and argon.  
22  
23  
24

1           35. A method of forming a shallow trench isolation region,  
2 comprising the following sequential steps:

3           forming openings extending into a substrate, the openings extending  
4 less than or equal to about 1 micron into the substrate, the substrate  
5 comprising steps at peripheries of the openings;

6           heating the substrate in the presence of oxygen to form a first  
7 layer of silicon dioxide within the openings; and

8           forming a second layer of silicon dioxide within the openings to  
9 fill the openings, the forming the second layer of silicon dioxide  
10 comprising:

11                 forming a high density plasma proximate the substrate;

12                 flowing gases into the plasma, at least some of the gases  
13 forming silicon dioxide;

14                 maintaining the substrate at a temperature of at least about  
15 500° C; and

16                 while maintaining the substrate at said temperature,  
17 depositing the silicon dioxide formed from the gases within the  
18 openings and over the steps, the depositing achieving better step  
19 coverage than would otherwise occur at lower temperatures.  
20

21           36. The method of claim 35 wherein the gases comprise  $\text{SiH}_4$   
22 and oxygen.  
23  
24

37. The method of claim 35 wherein the maintaining the temperature of the substrate comprises heating the substrate with the plasma.

38. The method of claim 35 wherein the silicon dioxide is deposited at a deposition rate, and further comprising etching the deposited silicon dioxide with the plasma at an etch rate, a ratio of the deposition rate to the etch rate being at least about 4:1.

39. The method of claim 35 wherein the ratio of the deposition rate to the etch rate is at least about 6:1.

40. The method of claim 35 wherein the ratio of the deposition rate to the etch rate is at least about 9:1.